JPRS 79380

5 November 1981

China Report

SCIENCE AND TECHNOLOGY

No. 135

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CHINA REPORT

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PAST, PRESENT, FUTURE OF RADIO, TV IN CHINA REVIEWED

Beijing DIANZI SHIJIE [ELECTRONIC WORLD] in Chinese No 5 1981 pp 2-4

[Article by Staff Reporter Li Feng [7812 1496]: "The History, Present Situation, and Future of Our Nation's Broadcasting and Television"--Interview With Huang Yun [7806 1496], Deputy Chief Engineer of the Central Television Station]

[Excerpt] We listen to radiobroadcasts and watch television every day, and everyone is interested in the development of broadcasting and television in our nation. Not long ago, on the occasion of the national conference of activists in the popularization of electronic sciences, we visited the deputy chief engineer of the Central Television Station, Comrade Huang Yun, and asked him to talk anout the history, present situation, and future of the development of our nation's radiobroadcasting and television.

Comrade Huang Yun is a permanent member of the Chinese Electronics Society and deputy chief of the popularization committee. When we proposed this topic, he accepted the "task" willingly and enthusiastically acquainted us with the situation.

Historical Retrospect

Comrade Huang Yun is an eyewitness to radiobroadcasting in old China. He was one of the participants in the building of the people's broadcasting business. Thus, when talking anout its history, he told it as if it were a family treasure.

Radiobroadcasting in China began during the 1920's. Inside the telephone station across from the Xidan Market in today's Beijing City, there once was a broadcast station. The power of the transmitter was 100 watts. This radio station, assembled with parts from abroad, was our nation's first broadcast station. At the time, the radio programs consisted mostly of broadcasts of Beijing Opera from theaters. The radios of that time were mostly crystal sets, the volume was low, there was a lot of distortion, and the sound was like the sound of the telephone. At that time there were a few electron tube radios. The electron tube had a head as large as a light bulb. The tube was placed in a wooden box 2 or 3 chi in length, and on top of the box was a big iron speaker with a bent neck. The speaker was as large as a 12-inch table fan, and the quality of the sound was not good. Even so, at that time, being able to sit at home and listen to Beijing Opera was an enjoyment. Some old people would sit for half a day when they turned on the radio. More precious at the time was having a large-speaker electron tube radio. The whole family would gather around the "electronic box," and the scene was even more lively.

In the 1930's, other large cities gradually had their own radiobroadcast stations--there were several in Shanghai alone--but most were small and scattered. Later, the Kuomintang built a broadcast station in Nanjing whose power was said to be "the greatest in the Far East." The power was 75 kilowatts. Because there were no high-power electron tubes, the final output used 18 water-cooled electron tubes.

When we asked him when he became interested in radio, he reminisced: "When I was still an elementary school student, I accidentally came across a magazine that contained an article on how to build a crystal radio set, and I was attracted. I immediately prepared the materials and went to a Chinese medicinal herb shop and spent two copper coins (the money of that time) to buy several peices of 'natural copper' for the detector. When I heard the sound of broadcasts from the crystal set I had made myself, I was so happy I jumped in the air. From then on, radio and I became inseparable." As it turned out, he was also a radio lover.

Xinhua Broadcasting Station

At the beginning of the War of Resistance Against Japan, the liberated areas did not have their own radio stations. The airways of the motherland were filled with the radiowaves of the reactionary propaganda of the enemy and the false government. To spread the truth and break the enemy's monopoly of the radiowaves, the Party Central Committee established the Xinhua Broadcasting Station in northern Shaanxi. On 30 December 1940, it officially began broadcasting with the call letters "XNCR" (X is the international designation for the first letter of Chinese radio stations; the remaining three letters were the abbreviation for New Chinese Radio); the frequency was 7,500 kiloHertz. Although the power was only 200 watts, [the station] served an important function in propagandizing the goals of our armed forces and exposing the schemes of the enemy.

When our conversation reached this point, Comrade Huang Yun told us about the story of Comrade Liu Shanben [0491 0810 2609], who defected from the enemy in a plane. Liu Shanben originally was in the Nationalist Air Force. He listened for a long time to the broadcasts of XNCR, he became enlightened, and under the call of the revolution he flew a large bomber from the region controlled by Chiang Kai-skek and defected to Yan'an, where he was welcomed enthusiastically by our armed forces. Later, Comrade Liu Shanben contributed to the preparations for building our people's air force.

Comrade Huang Yun went on to point out that during the war years, the people's broadcasting activities developed in a situation where equipment was very difficult to come by. Sometimes, to obtain a resistor with a suitable resistance value, many resistors had to be connected serially or in parallel. The antenna was connected to a railroad track. A cave with a blanket was the broadcast studio. Under the care of the Party Central Committee, comrades who were engaged in broadcasting at the time relied on a high degree of revolutionary enthusiasm and a sense of responsibility, and overcame various difficulties. Up to the eve of liberation, broadcast stations were established one after another in the liberated regions in the Northeast, North China, and the Northwest. The largest transmitting power had reached 300 watts.

Development of People's Broadcasting

As the revolution won victories, broadcasting in the areas that had been controlled by the Kuomintang was returned to the people and given new life. As he described the scene of the PLA receiving the Beijing Radio Station from the Kuomintang, Comrade Huang Yun said the transmitting station at Shuangqiao in Dongjiao had not been able to afford to pay the electricity bill and the machines had long since stopped operating. Because there was no coal, there was no heating. The large equipment room had only several guards standing around a small stove shivering in the cold. After entering the town, we quickly reestablished broadcasts and changed the name to the Beiping Xinhua Broadcast Station.

After liberation, as socialist construction developed in our nation, a number of large transmission stations were gradually built. Each province had large power transmitters.

As transistor technology developed, the receivers also developed from electron tube radios to transistorized radios with stable properties and small consumption of electricity. At present, according to incomplete statistics, the nation has a total of over 80 million radios. Annual production is nearly 20 million units, with over 250 varieties.

The other way that our nation's broadcasts have become popular is through cable broadcasting. Powerlines form a huge broadcasting network spanning our nation's territory, connecting the border regions with the heart of the motherland--Beijing. People's broadcasting has served immeasurably in [aiding the] socialist revolution and construction of the motherland and in enriching the people's political and cultural life.

The present Central People's Broadcasting Station has both amplitude modulation broadcasts and frequency modulation broadcasts. In addition, it has worldwide broadcasts in 39 languages under the call sign "Radio Beijing."

Our Nation's Television Broadcasts

The development of broadcasting enabled us to listen to voices from the [various] regions of the world. But as the popular saying goes: "Hearing a hundred times is not as good as seeing once." The people's demands for the transmission of pictures led to the development of television technology.

Research in television technology began before World War II. Later it was interrupted because of the war. After the war, the United States was the first nation to begin television broadcasting, and other nations followed. Japan tested telecasting in 1954.

Preparation for television broadcasting in our nation began in 1956. There was a debate as to whether we should rely on others or develop television ourselves. At the time, one foreign engineer believed that for the Chinese to rely on themselves to develop television, it would take at least 15 years at the earliest. Therefore he suggested that we import full sets of equipment. The 'unselfish helpers" at the time also suggested they they help us design. They said that they would use their own equipment, but that even this would require 5 or 6 years before test telecasting could become a reality. We selected the road of self-reliance, won the final victory ahead of time, and acted proudly for the Chinese people.

The Beijing Broadcast Equipment Plant, Qinghua University, and the Broadcasting Administrative Bureau jointly shouldered the task of trial-manufacturing television equipment. After slightly more than 1 year, we developed our nation's first set of telecasting equipment. On 1 May 1958, the "Beijing Television Station" was born. Afterward, television stations were established one after another in Shanghai and other cities. The largest number of stations had at one time reached over 20, and research in color television technology had also started. It is a pity that the 3 years of economic difficulties and 10 years of unrest hindered the development of our nation's television. Beijing Television Station even stopped telecasting for a period, creating a very bad effect.

In 1973, Beijing Television Station began trial-telecasting in color. After the "gang of four" was smashed, the name was changed to Central Television Station, and another television station was built in Beijing. At present, except in Xizang, television transmission towers cover every province and city in the nation. There are also many relay stations. The programs telecast from the Central Television Station are transmitted to every region of the nation via a microwave trunkline.

While developing transmission technology, we also began the development of television receivers. In 1958 over 200 television sets were produced. In recent years our nation's television receivers have developed greatly. According to estimates, there now are over 6 million television sets throughout the nation, production in 1980 had already reached 2.2 million units, and there are a certain number of color television sets.

The Future of Broadcasting and Television

Discussing our nation's development in radiobroadcasting and television, Comrade Huang Yun believes a very important question is how to expand the area of television coverage so that people throughout the nation can watch television. A second question is how to use advanced technology in broadcast techniques.

Satellite Broadcasting and Television. Because television signals are transmitted by ultrashortwaves, they are limited by the curvature of the earth and can be transmitted only in straight lines of "visual distance"--i.e., even if the television transmitting tower is built very tall, the distance of the transmission can only be up to 100 kilometers. At present, microwave relays are used to transmit programs to the capitals of 28 provinces (cities, and autonomous regions) and to some large and medium cities near trunk lines. Relying on the "line-of-sight" transmission method to realize large area coverage has many difficulties; the basic solution is to establish a satellite television broadcast system. A radio and television broadcast satellite that is synchronous with the earth's rotation can enable [people] anyplace in China to see Central Television Station programs. Three such satellites can realize global relay broadcasts. As long as there is a parabolic surface antenna 60 centimeters in diameter trained on the satellite, direct reception is possible, or the programs can be received by the ground relay station and then relayed to users' receivers.

Talking about this, Comrade Huang Yun also mentioned an interesting "time difference" problem. The time difference between the eastern part and western part of our nation is about 2 hours. For example, 7 pm in Beijing is the "golden time" for watching television but in Urumchi it is still daytime and people have not yet finished the day's work! Therefore, broadcasts to the western regions must be delayed 2 hours to suit local living customs.

"Doesn't the Central Television Station receive television news via satellite now?" Comrade Huang Yun said this segment of programing is received by the Shanghai satellite ground station from a foreign satellite flying over the Pacific. It is then transmitted by microwave relay to Beijing, and the Central Television Station records the images and then rebroadcasts them. Our nation's important television broadcasts are also realized via this system.

Frequency Modulation Stereo Broadcasting. As electrical and audio technology develop and the people's living standards rise, a demand for a higher quality of broadcast sound has emerged. At present, amplitude modulation broadcasts have poor sound quality, there is a lot of noise, and mediumwave frequency stations are crowded. To expand the frequency band, improve the quality of the sound, and increase the ability to resist interference, frequency modulation stereo broadcasting must be developed.

After Comrade Huang Yun had acquainted us with the situation regarding the development of frequency modulation broadcasting, he said the Central Radio Station is preparing for frequency modulation stereo broadcasts. In fact, some local broadcasting stations have already begun test broadcasts in stereo.

9296
CSO: 4008/459

APPLIED SCIENCES

SELF-INDUCED POLARIZATION CHANGES OF LASER BEAM IN GLASS

Shanghai JIGUANG [LASER] in Chinese Vol 8 No 4, Apr 81 pp 22-24

[Article by Zhang Meizheng [1728 2734 3791], Deng He [6772 0735] and Li Chengfu [2621 2052 1381] of the Shanghai Institute of Optics and Fine Mechanics of the Chinese Academy of Sciences: "Self-Induced Polarization Changes of the 1.06-Micron Laser Beam in Glass"]

[Text] Abstract: We used a TEM_{00} mode neodymium glass laser system and observed changes of self-induced polarization of a laser beam in some optical glass and laser neodymium glass. The experiment measured their nonlinear polarization parameter C_{1221}, and determined their nonlinear refractive coefficient n_2.

I. Introduction

The nonlinear effect of strong lasers and transparent media can cause the optical properties of materials to change. Of the changes, the main one is the nonlinear change of the refractive coefficient of the material:

$$n_0 = n_2 + n E^2/2, \qquad (1)$$

where n_0 is the linear refraction of the material, E is the vector of the electric field of the light wave, and n_2 is the nonlinear refractive coefficient. The nonlinear change of this type of material conversely affects the light beam itself, causing a lot of self-induced reactions of light. Self-induced polarization change (SIPC) is very important among the self-induced reactions.(1, 2).

In 1972, Owyoung et al used a single mode ruby laser and measured the SIPC(3,4) of some glass and crystals (YAG), and obtained a precision of about 10 percent. This is at present the most accurate report concerning the values of n_2. Here we have introduced the experimental results using a 1.06-micrometer single mode laser.

II. Principle

A quasi-monochromatic elliptically polarized light can be composed of a "positive" and a "negative" circular polarized light, i.e.:

This article was received on 14 January 1980.

$$E = A_+ e^{i\Psi} e_+ + A_-\hat{e}_- \qquad (1)$$

where Ψ is the initial phase difference between the positive and negative circular polarized components. Its third order nonlinear polarization in an isotropic medium can be written as:

$$P_+^{(3)} = \left\{6C_{1122}(A_+^2 + A_-^2) + 6C_{1221}A_-^2\right\} A_+ e^{i\Psi} \qquad (2)$$

$$P_-^{(3)} = \left\{6C_{1122}(A_+^2 + A_-^2) + 6C_{1221}A_+^2\right\} A_- \qquad (3)$$

The variations of their nonlinear refraction produced in the medium are:

$$\delta n_+ = \frac{12\pi}{n_o}[C_{1122}(A_+^2 + A_-^2) + C_{1221}A^2] \qquad (4)$$

$$\delta n_- = \frac{12\pi}{n_o}[C_{1122}(A_+^2 + A_-^2) + C_{1221}A_+^2 \qquad (5)$$

We can see from equations (4) and (5) that under elliptic polarization, the variations of refraction caused by the positive circular polarized light and the negative circular polarized light are not equal (because $A_+ \neq A_-$). The phase difference generated between them is:

$$\delta = \frac{w}{c}\frac{12\pi}{n_o}C_{1221}(A_-^2 - A_+^2)z \qquad (6)$$

where z is the distance of propagation of the light beam in the medium. Because of the phase difference δ between the positive and the negative circular polarized light when the beam of light exits the medium, the main axis of the polarized ellipse rotates an angle θ at z:

$$\theta = \frac{1}{2}\delta = \frac{6\pi w}{n_o c}C_{1221}(A_-^2 - A_+^2)z \qquad (7)$$

Using the average power density of the light beam to represent the above, we have:

$$\theta = \frac{48\pi^2 w}{n_o^2 c^2}C_{1221}P_z \cos 2\phi \qquad (8)$$

where $P = \frac{cn_o}{8\pi}E^2$; $E^2 = A_+^2 + A_-^2$, the intensity of the total electrical field of the light wave; $tg\,\phi = A_+/A_-$. Equation (8) shows that after a strong elliptically polarized laser passes through a medium, the angle θ of rotation of its polarized ellipse and the power density P of the light beam, the length of the medium z, and the nonlinear polarization parameter C_{1221} are proportional. We only need to measure the relationship between the angle θ of rotation of the polarized ellipse and the power density of light to obtain the nonlinear polarization parameter C_{1221} from equation (8) and the nonlinear refractive coefficient n_2 under distortion of the pure electron:

$$n_2 = \frac{36\pi}{n_o} C_{1221} \qquad (9)$$

III. Experimental Installation and Method

We used a TEM_{00} mode neodymium glass laser system (first magnitude oscillator and third magnitude amplifier). The resonance cavity of the oscillator was a stable planar-spherical cavity, the length of the cavity was 137 centimeters. We used a KDP crystal as the Q switch. The width of the semipolar value of the laser pulse was 100 millimicroseconds. Inside the cavity we added a $\phi 2$ aperture that selected a single transverse mode. The laser output from the oscillator passed through the third magnitude neodymium glass amplifier and was amplified. The total output energy could reach above 6 joules, the diameter of the light beam was about $\phi 8$. The experimental installation is illustrated in Figure 1. The laser beam output by the laser system passed through a long focal length lens (f = 3.5 meters) and entered a Rochon polarizing prism P_1. The Fresnel rhomb R_1 caused the incident linear polarized light to become an elliptically polarized light (the incident plane and the direction of polarization of the laser in R_1 formed a 22.5° angle). The sample was placed behind the focal point of the lens L to obtain the appropriate diameter of the light beam. The direction of the second Fresnel rhomb R_2 was parallel to R_1, and when rotation of the polarized ellipse did not occur, the elliptically polarized light became a linear polarized light. We adjusted the direction of the Rochon polarizing prism P_2 so that the output o light was the smallest and the e light was the largest. The energy detectors C_1, C_2, C_3 respectively measured the total input energy, the o light energy and the e light energy. When the strong light beam passed through the sample, the polarized ellipse rotated. This was manifested by an increase in the signal in the direction of the o light. The ratio of the power P_o of the light measured in that direction and the total power P of light entering the sample is F:

$$F = \frac{P_o}{P} = \frac{e_o}{e} \qquad (10)$$

where e_o, e are the corresponding energies measured. This ratio and the angle of rotation of the polarized ellipse have the following relationship:

$$F = (\sin 2\phi \sin\theta)^2 \qquad (11)$$

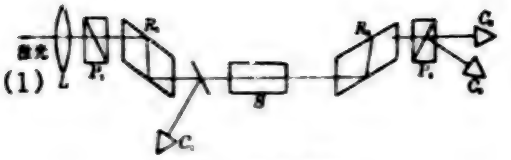

图1 实验装置图

L—透镜(f=3.5米); P_1、P_2—洛匈棱镜; R_1、R_2—费涅尔菱体; S—待测样品; C_1、C_2、C_3—能量检测器

Figure 1. Illustration of the experimental installation.

Key:

1. Laser
L. Lens (f = 3.5 meters); P_1,P_2 - Rochon polarizing prism; R_1, R_2 - Fresnel rhomb; S - sample to be tested; C_1, C_2, C_3 - energy detector.

Table 1. Nonlinear Polarization Coefficnets and Nonlinear Refractive Coefficients n_2 of Various Types of Glass

(1) 玻璃牌号	$n_{1.06}$	(2) θ (功率为500兆瓦/厘米²)	C_{1111} (10^{-15} esu)	n_2 (10^{-13} esu)		
				(3) 实验值		(6) 计算值[6]
				(4) SIPC法(线偏光)	(5) 自聚焦法[5](自然光)	
BaF-2	1.5567	3°24′	4.12	3.0	4.1±0.4	3.6
ZF 2	1.6510	5°12′	7.26	5.0	2.7±1.1*	5.5
ZF 7	1.7746	7°31′	11.77	7.5	6.4±1.1	9.0
N_{0312}	1.5115	2°18′	2.62	2.0	1.9±0.4	1.8
N_{1612}	1.5079	2°10′	2.45	1.8	1.6±0.5	1.9
$N_{31\text{-}25}$	1.5744	2°11′	2.72	2.0	1.3±0.3	1.5
[illegible]	1.530	2°[illegible]	2.44	1.6		1.1

(7) *测量时,材料的光学质量不好,数据偏低

Key:

1. Label of glass
2. (Power is 500 megawatt/centimeter²)
3. Experimental value
4. SIPC method (linearly polarized light)
5. Self-focusing method (5) (natural light)
6. Calculated value (6)
7. *At the time of taking measurements, the optical quality of the material was not good and the data are lower

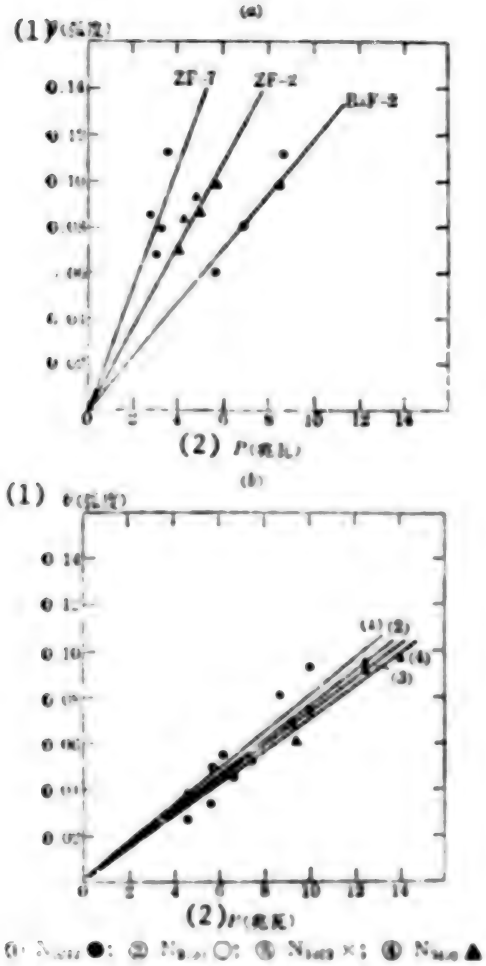

图2 自感生偏转角与激光功率的关系

Figu :. The relationship between the angle of rotation of self-induced polarization and the power of the laser.

Key:
1. (Radian)
2. P (megawatt)

IV. Results and Discussion

We tested and observed some optical glass (BaF-2, ZF-2, ZF-7), neodymium silicate glass (N_{0312}, N_{1012}) and neodymium phosphate glass (N_{2120}, N_{2420}). In the installation shown in Figure 1, when the sample was not placed in it, the measured F was very slight. This showed that when a nonlinear effect was not produced, the polarized ellipse of the laser beam did not rotate. When the 10-centimeter-long sample was placed in the path of the light, and as the incident laser energy increased, we could observe that the energy in the direction of the o light gradually increased (i.e., F increased). This showed that the polarized ellipse of the laser rotated more as the power increased. According to equations (10) and (11), we have determined the relationship between the angle of rotation θ of the ellipse of each material and the incident power as shown in Figures 2(a) and (b). According to equations (8) and (9), we determined the nonlinear polarization C_{1221} and the nonlinear refractive coefficient n_2 of the various materials from the slope of the straight line shown in Figure 2. The results of the experiment are listed in Table 1. It can be seen from Figure 2 that the rotation of the polarized ellipse of the laser beam and the power of the laser are proportional. For different materials, the slope of the straight line is different. When the power density was 500 megawatts/centimeter^2, the angles of rotation of the ellipse of the various materials were: ZF-7: 7°31'; ZF-2: 5°13'; BaF-2: 3°24'; the angle of rotation of the ellipse of the various types of neodymium glass was about 2°15'. Table 1 also lists the values(5) of the nonlinear refractive coefficient n_2 measured by us previously using the self-focusing method and the values of n_2 calculated by the empirical formula used in reference 6. It can be seen that these results are basically consistent.

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9296
CSO: 8111/1878

APPLIED SCIENCES

USE OF REMOTE SENSING TECHNOLOGY IN SURVEYING DESCRIBED

Beijing GONGCHENG KANCHA [ENGINEERING SURVEYING] in Chinese No 6, 22 Nov 80 pp 42-46

[Article by Jin Hengding [6855 0077 0002] of the Tianjin Surveying and Design Academy of the Ministry of Water Conservancy: "Application of Remote Sensing Technology in Engineering Surveying"]

[Text] I. Brief Introduction to Remote Sensing Technology

Remote sensing technology is based on the theory of electromagnetic waves. It does not come directly into contact with the subject of observation. It is a scientific method of understanding the existence, properties and scale of the observed objects from a high altitude or from a remote distance via sensors. A remote sensing system has five components: transport, sensors, ground receiving stations, image processing, and image interpretation.

Remote sensing is characterized by high speed gathering of a large range of data. Since the 1960's, it has developed rapidly. At present, there are 75 nations and 79 professions that utilize remote sensing technology, thereby greatly conserving the time and cost of field work, overcoming rain in the tropics, high mountains and steep cliffs, and difficulties in transportation. It has enabled the gathering of data which was difficult to obtain by traditional surveying methods.

Based on differences in the means of transport, remote sensing technology can be divided into three main categories: remote sensing in space, aeronautical remote sensing, and ground remote sensing.

The following six methods of remote sensing technology are used in engineering and geological surveying:

1. Visible light remote sensing. This includes black and white photography and color photography utilizing the light waves of visible light in the spectrum. The sensor is a channel of wavelengths between 0.40 and 0.76 microns.

2. Multiple wavelength remote sensing. Within the range of the spectrum from visible light to infrared, many narrow wavelengths are utilized for simultaneous photography. The sensor has a multitude of channels--a maximum of 13. At present, the range of wavelengths utilized is from 0.41 to 14 microns. Based

on the difference in the method of image formation, remote sensing can be further divided into three methods: multiple wavelength scanning, multiple wavelength photography and multiple channel television imaging.

3. Infrared remote sensing. This is the method of using the infrared rays of the spectrum for remote sensing. According to the different methods of imaging, this can be further divided into infrared scanning, black and white infrared photography, and color infrared photography. The wavelengths used by the sensor at present are between 0.70 and 14 microns.

4. Microwave remote sensing. This remote sensing method is divided into two types based on whether there is an emitting source or not: passive (without an emitting source) microwave remote sensing with a microwave radiometer as its sensor; and active (with an emitting source) microwave remote sensing with the microwave scattering meter, microwave altimeter, microwave imaging radar and microwave holographic radar as its sensors. The aerial sideview radar is an aerial remote sensing method developed on the basis of the imaging radar. Its operating frequency generally utilizes the X band (2.7 to 5.8 centimeters) and the K band (0.83 to 2.7 centimeters). The microwave has a definite ability to penetrate geological bodies, and its depth of influence is equivalent to about 20 times its wavelength. Sideview radar can penetrate heavy fog, trees and coatings. The use of the composite aperture sideview radar of multiple frequencies and multiple polarization enables us to understand the anisotropism of geological bodies and recognize geological bodies, tectonics and to find underground water. The sideview radar tube on the Apollo 17 spacecraft surveyed areas 10 to 1,300 meters beneath the surface of the moon.

5. Laser remote sensing is also called laser radar. The operating wavelengths of its sensors are from visible light to the near infrared range of the spectrum. At present, a laser sectional surveying and cartographic device, a laser altimeter, and a laser rangefinder are available. Laser remote sensing has many applications in the measuring profession.

6. Ultraviolet remote sensing. The sensor's operating wavelengths are in the ultraviolet range. The wavelengths presently utilized are between 0.28 and 0.40 microns. Based on the different methods of imaging, this can be further divided into ultraviolet photography, ultraviolet scanning and ultraviolet television imaging.

Of the methods discussed above, the first four remote sensing methods are the most popularly used. In the future, as remote sensing technology develops, more sensors and remote sensing methods will emerge.

II. Remote Sensing Images

Remote sensing images are the data resulting from remote sensing work. There are many varieties. The images are formed by processing and copying information obtained by the sensor onto magnetic tape or film. In general, there are the following types of images:

1. Photographic image. This type of image produced by remote sensing directly reflects the characteristics of surface features, i.e., ordinary photographs such as satellite photographs, aerial photographs, and land photographs. The difference between such photographic images and ordinary photographs is that they utilize different ranges of electromagnetic waves in the spectrum, thus expanding the range of view and reflecting more surface features and properties. For example, the image of temperature differences reflected in an infrared image is not found in ordinary photographs. Photographic images are of two types, black and white images and color images.

2. Composite image. This is produced by images of remote sensing from more than two types of frequency channels, showing the advantages of each and better reflecting surface features, such as false color images and composite false color images produced by multiple wavelength imaging and sideview radar imaging.

3. Separate image. This is an image separated into different levels according to chromatic levels or the scale of greys from the image obtained by the sensor based on working needs, such as a separate density image or an image of filtered waves in space obtained by the use of polarization techniques. The former is frequently used to differentiate lithological characteristics, distribution of minerals and for finding the corresponding area. The latter is helpful in tectonic analysis.

4. Digital image. This can be divided into two kinds: one involves the use of numbers to represent the information obtained, such as microwave digital images, and the other is the image obtained from the computer by automatic recognition of photographic images.

5. Symbolic image. This is an image obtained from the computer by automatic recognition of photographic images.

Under certain conditions, each of the five types of images described above can be transformed from one to another. These images are all useful in engineering, geological and hydrogeological interpretation. At present, because of limited conditions, generally black and white pictures and color images are used the most.

The difference in the means of transport directly reflects the distance between the sensor and the target object. The practical significance is related to the size of the scale and the resolution. For example, the smallest scale of an image produced by space remote sensing is 1:18,000,000, the ground resolution of the corresponding image is 2 kilometers. The scale of the satellite image of Landsat is 1:3,300,000, the ground resolution is 70 meters. The satellite image of the exploratory satellite Pegasus I has a ground resolution of 0.3 meters. The scale of images produced by aerial remote sensing is 1:10,000 to 1:50,000, and it can be magnified to 1:2,000 or 1:5,000. The scale of images in ground remote sensing is generally less than 1:5,000 and the resolution is greater.

The scale of images in remote sensing indicates that aerial and ground remote sensing have greater significance in engineering and geological surveying and hydrogeological surveying. They can be used at different stages and for different purposes in engineering and geological and hydrogeological surveying.

III. Interpretation of Remote Sensing Images

Interpretation of remote sensing images is the final goal of application of remote sensing technology. Because remote sensing can obtain massive amounts of information, the image data can be used by various professions, so it has the characteristic "one remote sensing operation can serve many uses." The quality of the resulting interpretation is determined by the professional knowhow of the workers and the level of knowledge of remote sensing. The process of changing information from remote sensing images into geological data is geological interpretation. The methods of interpretation include ordinary observational interpretation, electronic and optical interpretation and computer interpretation. Regardless of which method is used, related information must be utilized before the goal of interpretation can be achieved. This type of related information in ordinary observational interpretation is called interpretative signs. Frequently used geological interpretative signs are color, shape, size, shade and related bodies. Linear and circular elements in satellite images have great use in the interpretation of geological tectonics and lithological characteristics.

Interpretation of separate density images, digital images and symbolic images includes not only the content shown in the image and its representative meaning: often, the result of interpretation are better when photographic images are used in combination.

IV. Brief Description of the Application of Remote Sensing Technology Abroad

There are already many examples of application of remote sensing techniques in engineering and geological surveying abroad. For example:

1. The Philippines used four types of remote sensing data--aerial sideview radar measurements, color and black and white aerial photography, infrared aerial photography (used for studying the coastal regions) and the multiple wavelength images of Landsat (used to study regional geological tectonics)--in selecting the site for the country's first nuclear power plant. After combined indoor interpretation and field surveys, the various requirements for the selection and the design of the nuclear power plant site were satisfied.

2. During the mid-1960's, Brazil planned to develop the hydrological resources in the northeastern region, for which it used aerial photography, aerial sight measurements and physical probes, and it was able to conduct a comprehensive study of 110 square kilometers of the planned region; 2,800 kilometers of river segments and 231 preliminary dam sites were found. After comparison, 19 dam sites that had good natural conditions and a low unit cost were selected as targets for near term development.

3. In the mid-1960's, during the geological surveying for Butler Dam and the Blue Lake construction project, the United States used five kinds of remote sensing methods--black and white and color aerial photography, infrared scanning, aerial multiple wavelength remote sensing, aerial sideview radar and Landsat's multiple wavelength images--and studied and solved a series of geological problems:

1) The lithological nature and geological and tectonic characteristics of the foundation of the dam, the dam shoulder, the spillway, flood relief projects, reservoir area, road detours and power lines;

2) Stability of the rock body of the side slopes of the banks of the reservoir;

3) Distribution and distances of regional faults and shear zones;

4) Regional seismic and geological data;

5) Survey of building materials;

6) Physical and geological phenomena, such as mountain creep and devolutions.

Cases of using remote sensing technology in engineering and geological surveying of dam sites also include the Buzangle [phonetic] Dam in France, Switzerland's Oberland dam sites and the Goscheneralp Dam site and Iran's Middle East dam site. It is believed that color aerial photographic images have more visible tonal contract, which facilitates the direct drawing of various geological maps. Color infrared photographic images can show the conditions of weathering and can clearly indicate large areas of the ground surface layer containing large amounts of water. In the Buzangle [phonetic] region, a fault zone was discovered. This could not be seen at all in black and white photographs. Heat probe images can reflect the lithological nature and fragmentation zone of a fault and hydrogeological phenomena according to the changes in thermal radiation. A definite relationship exists between the intensity of radiation and the modulus of elasticity, water content, and degree of weathering. At the Middle East dam site, the point of intersection of the rift system and the position of springs and karst caverns were shown. Therefore, it is believed that these three types of remote sensing images are especially useful in engineering and geological surveying.

4. In engineering and geological surveying to select roads through tunnels and tunnel sites, Japan used aerial remote sensing technology and obtained definite achievements. It is believed that the following geological problems can be clarified with the use of such technology:

1) Rock formation (horizontal, inclined, vertical, inverted, buried);

2) Thickness of a single stratum of rock layer, stratigraphic order of the rock strata;

3) Rock body structure (massive, bedded, schistose);

4) Land form and geomorphological types and characteristics;

5) Hardness of rocks;

6) Mineral content of rocks, especially the content of harmful minerals;

7) Internal structure of rocks, compactness, porosity, development of crevasses;

8) Weathering and fragmentation of rocks (such as faults, cleavage, fragmented zones, weathering, mylonitization, kaolinization);

9) Water sources at the construction site and in surrounding areas;

10) Physical and geological phenonema, especially the possibility of buildings and mouths of tunnels being damaged by mountain creep, landslide, devolution, avalanche.

5. Japan's Nakawata Reservoir is located in a sandstone and sandy slate region of the Permocarboniferous system. There is a regional fault passing through nearby, the rocks are fragmented, mountain creep has developed widely, and for this reason, color aerial photographs covering 400 square kilometers were taken and interpretation of remote sensing images and ground surveying was carried out. A total of 419 devolved dikes higher than 20 meters were discovered; the largest landslide among them was as much as 2 million cubic meters.

6. The mountain creep of the Osaka-Fukame-Sanse area was observed dynamically using aerial remote sensing methods. From 21 February 1967 to 22 June 1968, aerial photographs were taken during 11 flights, on the average of once each month, at a flying altitude of 800 meters, and the scale of the images was 1:5,500. Fixed signposts were not set up on the ground; instead, eaves of buildings, corners of stone walls, roots of trees and such fixed surface features at 460 points were utilized. The images were interpreted and it was concluded that during the most violent moment of creeping, the speed of movement reached 20 to 25 centimeters/day, reflecting the sliding movement of the mountain creep.

7. P. Vincent et al of the Ann Arbor Geological Spectrum Company of the United States took our nation's Xingtai Prefecture as an example to explore the use of remote sensing images to study the relationship between linear traces and seismic centers of earthquakes, and they found that a good coorelation exists between the density of the seismic center and the density of the lengths of directional rifts. They believe this model may be useful in pointing out the danger zone of highly violent earthquakes.

8. Great Britain and Canada, utilizing remote sensing technology in surveying underground water, believe the following data can be obtained.

1) Prediction of the existence of underground water, judging the type of water-containing strata of a region and estimating the possible amount of well water;

2) Mapping the strata containing alluvial water according to vegetation maps;

3) Estimating the equivalent amount of water from the accumulation of snow during winter, and from this, estimating the future amount of flow in rivers and the replenishment of underground water;

4) Predicting the need for water for irrigation according to the planting area of crops, and from this, estimating changes in the amount of underground water drawn;

5) Judging water seepage, vadose and underground water level of shallow strata on the basis of the distribution of hydrophilous plants;

6) Judging the position of the center of replenishment and the distribution of seasonal lakes;

7) Monitoring the development of urban construction and forecasting future problems concerning underground water;

8) Studying the hydrological significance of regional topography and geological structure;

9) Judging the sources of acidic water pollution on the basis of the development of open cast mines and monitoring land reclamation;

10) Surveying and mapping faults and joints of hard rock regions, and thus finding rich concentration zones of underground water;

11) Surveying and mapping circular topography that may affect the amount of partially underground water.

V. The Use of Remote Sensing Technology in Our Nation

Remote sensing data are gradually being used in domestic engineering and geological surveying. For example, surveying for selection of factory sites and for water supplies in Yunnan, Henan, Guangdong, Shanxi provinces; investigation of karst seepage in reservoirs in Yunnan, Guizhou, Guangxi and Qinghai provinces; investigation and study of induced earthquakes at the Xinfengjiang Reservoir in Guangdong and the Danjiangkou Reservoir in Hubei; surveying for railroad line selection, tunnels, bridges; general survey of underground water in Shanxi and Nei Monggol; surveying of underground water in shallow strata in the Tianjin area; investigation and research on liquefaction during the Tangshan earthquake, etc.,have all used interpretation of remote sensing images in varying degrees. Based on understanding, during engineering and geological surveying, the use of remote sensing techniques in investigating the following problems has been beneficial:

1. Distribution, scale, nature and type of topography and geomorphology of construction zones;

2. Distribution of transportation and traffic lines and residential points in construction zones;

3. Distribution, occurrence, structure and nature of ground surface rocks;

4. Distribution, scale and nature of folds, faults, crevasses, and reflection of partially hidden tectonics;

5. Distribution, scale and nature of physical and geological phenomena such as mountain creep and devolution;

6. Surveying for entrances and exits of tunnels and side slopes of cuttings;

7. Surveying the stability, submergence, seepage and runoff from banks of reservoirs;

8. Surveying the development of karst and related engineering and geological problems;

9. Surveys of construction materials.

VI. Actual Cases of Construction

Because of the need to study the problem of induced earthquakes at the Panjiakou Reservoir and to develop aerial remote sensing experiments, we utilized the American Landsat II satellite's multiple wavelength remote sensing images taken on 23 October 1975 and 25 October 1976, and false color composite images in combination with field survey data to carry out geological interpretation, and we obtained the following results:

1. Lithological characteristics and their distribution. From the pictures, we interpreted the distribution of the various rocks of gneiss, silicarenite, limestone, sandy shale, volcanic rock, granite and loess and accumulation at the foot of mountains (see Figure 1).

2. We analyzed and proved the existence of the two large tectonic belts crossing the reservoir, their distribution, their joining and the distribution and positions of rifts (see Figures 1 and 2).

3. Based on the interpretation of remote sensing images and analysis of regional data, we have formed the following views: 1) the two large tectonic belts have all undergone violent tectonic movements during geological periods; 2) the Yanzigu-Longjingguan rift belt has cut the Xinglong-Xifengkou rift belt and they have been rejoined in juxtaposition; 3) three tectonic stress fields—one extending east-west, one extending north-east, and one of arc-shaped tectonics—exist in the region of the Panjiakou Reservoir; 4) the two large tectonic belts, extending east-west and north-east, both have earthquake-bearing tectonic backgrounds; 5) Xifengkou, Longjingguan, Yanzigu (the Panjiakou Reservoir is situation among them) are regions where earthquakes most easily occur. The possibility of the reservoir inducing the occurrence of earthquakes after the reservoir stores water is very great, and this should be noted.

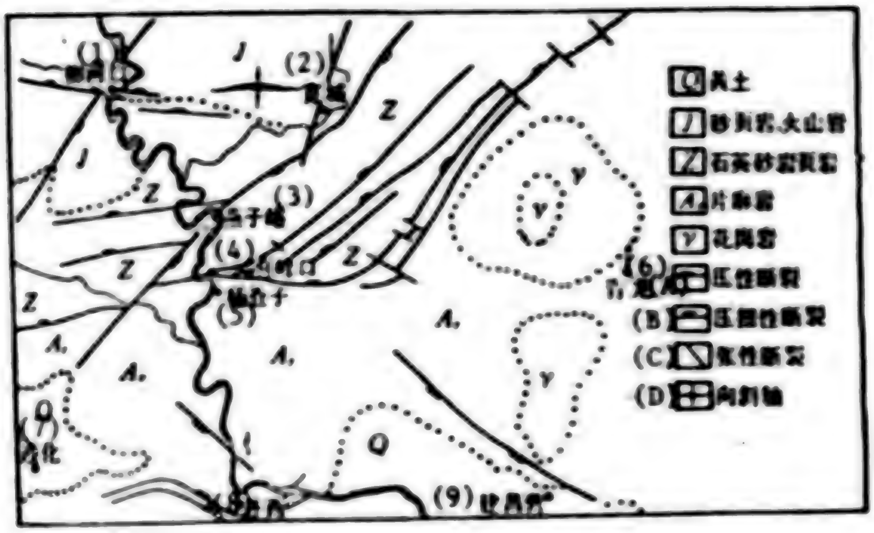

Figure 1. Geological diagram based on interpretation of remote sensing images.

Key:

1. Liuhekou
2. Kuancheng
3. Yanzigu
4. Xifengkou
5. Yangchazi
6. Qinglong
7. Zhunhua
8. Qianxi
9. Jianchangying

Q. Loess
J. Sandy shale, volcanic rock
Z. Silica sandstone shale
Ar. Gneiss
γ. Granite
A. Compressive rift
B. Compressive contorted rift
C. Tensile rift
D. Synclinal axis

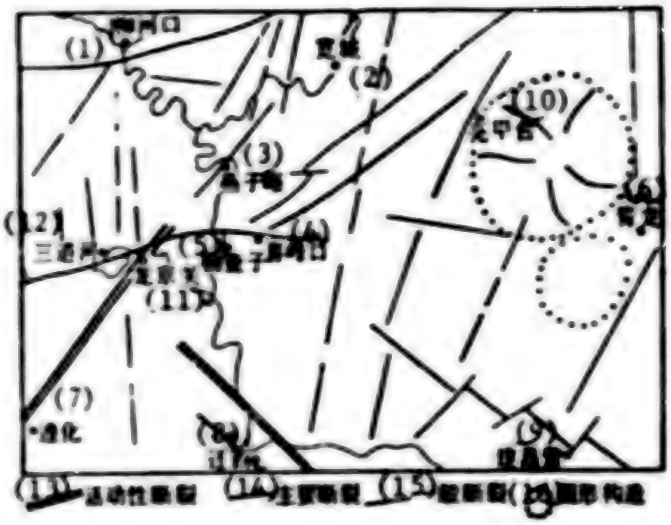

Figure 2. Rift distribution diagram based on interpretation of remote sensing images.

Key:

1. Liuhekou
2. Kuancheng
3. Yanzigu
4. Xifengkou
5. Yangchazi
6. Qinglong
7. Zhunhua
8. Qianxi
9. Jianchangying
10. Liangjiatai
11. Longjingguan
12. Santaohe
13. Active rift
14. Main rift
15. Ordinary rift
16. Circular tectonics

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9296
CSO: 8111/1876-B

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TITLE: "Spatial Distribution Characteristics of Total Radiation in a Ten-day Interval and Photosynthesis Potential in China"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 32-41

ABSTRACT: Many scientists have studied the subject of total solar radiation distribution in China but their reports are mostly limited to the calculation and distribution characteristic of radiation in a month. These data, therefore, are difficult to satisfy the needs of scientific research and production construction. In agricultural production and experimentation, photoenergy utilization of crops during their period of growth and development and photosynthesis experiments of industrial products, etc. all require total radiation data of ten-day periods or even shorter. This paper discusses the method of computing the total radiation of ten-day periods, the concept and the method of computing photosynthesis potential, the spatial distribution of total radiation in a ten-day period and its relationship to photosynthesis potential, and the tendency of change in time of the total radiation in a ten-day period, and the regionalization theory of photosynthesis potential. Ten-day solar radiation data and the photosynthesis potential of the Northeast, the Inner Mongolia Region, the North China, the Northwest, the Eastern Region, the Region of Sichuan, Yunnan, and Guizhou, and the Qinghai-Xizang Plateau are introduced.

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TITLE: "A Preliminary Study on Irrigation and Drainage Measures of Meadow Reclamation in Heilongjiang Province"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 62-69

ABSTRACT: Meadow reclamation discussed in the paper includes the 4 types of lake shores, vicinity of springs, banks of large rivers and streams, and valleys of small streams. Soils of these areas are thick and highly fertile. After reclamation, cultivation, drying, and maturation, the unit yield of these lands is generally 30 percent above slope lands, and doubling in some cases. The fields are flat and the condition of water is good and the only remaining problems are drainage and irrigation. Reasons for water accumulation of these lands and proper drainage measures are discussed. With successful drainage, irrigation during arid periods becomes necessary, of course. The construction of reservoirs and/or wells are discussed and recommended.

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TITLE: "The Experience and Lesson in Bringing Hulunbeier Grasslands Under Cultivation"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 70-81

ABSTRACT: Hulunbeier grasslands are located in the western border of the Northeast in China, including the 2 parts of the low western foothills of Daxinganling and the Hulunbeier highland. Originally, the Eastern part is a forest meadow-chernozem zone and the Western part is a semi-arid grassland-chestnut soil zone. After 1958, especially in 1960, a large scale agricultural reclamation project was carried out in the forest border of the eastern part and in the vast highlands of the western part. By the end of 1962, 25 state-operated farms encompassing close to 3 million mu had been established and a sharp contradiction between agriculture and grazing occurred. In 1963, 76 percent of the cultivated fields (2.26 million mu) was re-abandoned to grassland. The communes devoted to animal husbandry have no grain and feed bases, however. In 1972, the 4 banners had to buy 90 million jin of grain and the transportation cost alone was 600 thousand yuan. The bitter lesson of history points out clearly that if large scale reclamation and retreat from cultivation are not carefully planned, there will be a penalty according to natural and economic laws. The paper includes recommendations for resolving the problems of the eastern and the western parts of the region respectively.

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TITLE: "Estimation of Precipitation Change Since the Large Scale Reclamation and Cultivation on the Sanjiang Plain"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 90-96

ABSTRACT: The vast region of the Sanjiang plain of the Northeast is currently an important base of commercial grains in China. Since the middle 70's, the problem of aridity is becoming more severe every year. To date, about 1/3 of the region is under cultivation. As the marshes are drained and vegetative covers destroyed during reclamation, the area of water surface is reduced to cause the humidity to drop, the temperature differential to enlarge, the wind speed to accelerate, and wind erosion of soil to rise. This paper reports the establishment of a mathematical model for estimating the range of effect of reclamation on precipitation. The results demonstrate that the mean precipitation of Sanjiang plain before reclamation is 589.2 mm/year, and it is 536.9 mm/year after reclamation. Another calculation shows that the precipitation of the cultivated area and that of the uncultivated area of the plain are not obviously different. Analyses of historical data and the background macro-meteorology indicate that in Sanjiang plain, the period of the late 70's is determined to be arid by the principle of natural change more than any other factor.

6168
CSO: 4009/46

Biochemistry and Biophysics

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TITLE: "Analysis of Walsh Spectra of Stereoscopic Pairs"

JRCE: Shanghai SHENGWU HUAXUE YU SHENGWU WULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese No 3, Jul 81 pp 221-227

TEXT OF ENGLISH ABSTRACT: A tilted line composed of regular texture and described by the equation

$$\begin{cases} x^2 + y^2 = 20^2 z^2 \\ y = 0 \qquad\qquad 0 \le x < 512 \end{cases}$$

was projected to two planes, left and right, to form a stereoscopic pair. Several such stereoscopic pairs with various binocular disparities were transformed into Walsh spectra using Fast Walsh Transform (FWT) on the computer. There are relative shifts in the position of the peaks of two Walsh spectra of each stereoscopic pair. The degree of the relative shifts is proportional to the extent of disparity. The greater the disparity, the further the peaks will shift. The direction of shifts depends on whether the projected plane is close to the proximal end or distal end of the tilted line. The peaks of the spectrum of the plane close to the proximal

[Continuation of SHENGWU HUAXUE YU SHENGWU WULI XUEBAO No 3, Jul 81 pp 221-227]

end are shifted to the higher frequency and those of the plane close to the distal end are shifted to the lower frequency.

The characteristics of the Walsh spectra of the stereoscopic pair by FWT are just the same as those of the spatial frequency spectra obtained by Fast Fourier Transform (FFT). Because the Walsh transform can be operated on a computer more easily than can the Fourier transform and because FWT is faster than FFT, it is suggested that FWT be used instead of FFT if it is desired that stereoscopic pairs be processed.

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TITLE: "An Analysis of Spatial Frequency Spectra of the Stereoscopic Pair"

SOURCE: Shanghai SHENGWU HUAXUE YU SHENGWU WULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese No 3, Jul 81 pp 229-235

TEXT OF ENGLISH ABSTRACT: The spatial filtering method was used to see if there is any dominant frequency band of the stereoscopic pair in depth perception.

The stereoscopic pair of a tilted line was transformed into its spatial frequency spectra using the Fourier transform on a computer. Various components of the spatial frequency spectra were converted back to stereoscopic pairs. The reformed stereoscopic pairs seemed as though they were treated with spatial filtering. Low-pass, high-pass and band-pass filtering tests were performed and the following conclusions have been derived:
1. A stereo perception can be generated by looking at the stereoscopic pair obtained from the inverse transform of a small spectral fraction with the same frequency component of the right and left eyes. This fraction may be selected from any portion of the spectra and occupies only about 10 percent of the whole bandwidth.
2. Because a stereoscopic pair possesses depth information carried by binocular

[Continuation of SHENGWU HUAXUE YU SHENGWU WULI XUEBAO No 3, Jul 81 pp 229-235]

disparity and a stereo perception can still be formed even when a 90 percent fraction has been filtered out, it is suggested that the disparity is distributed among each frequency fraction, i.e., each frequency component contains the disparity.
3. The relative contrast is not important for generating depth perception. A stereo perception can be generated by relative contrast in the range from ∞ to 2 percent.

9717
CSO: 4009/61

Biophysics

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TITLE: "Engineering Modeling of Visual System and Progress in Vision Hypothesis"

SOURCE: Beijing SHENGWU HUAXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 4, Aug 81 pp 23-27

ABSTRACT: This paper introduces the subject by quoting David Marr, a MIT psychologist, saying in effect that the current neuropsychology and psychophysics are limited to describing the behavior of various cells and other objects of experimentation and do not seek to interpret such behaviors. For the purpose of understanding the information processing mechanism of the visual system and the relationship between its structure and function, aside from carrying out various levels of biological research, therefore, it is necessary to utilize the technique of simulation and modeling, common in engineering work, to regard the system as a black box to study its input and output relationship. Modeling of visual system has promoted the development of spatial image processing technology, the study on the relationship between vision and the human brain, cybernetics, artificial intelligence, etc. in the USA. Studies on this and related subjects by Blakmore, Louis, Sutro, Tallman, Kabrisky, et al, all of the USA, are very briefly introduced. There is no mention of related work in China.

This paper was received for publication on 10 Jul 80.

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TITLE: "An Electronic Model for Space Characteristic of Concentric Receptive and Image Enhancement Processing"

SOURCE: Beijing SHENGWU HUAXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 4, Aug 81 pp 28-31

ABSTRACT: Concentric receptive field is a structure of pre-processing the input image by the visual system. This paper reports a simulation and analysis, using electronic models, of the receptive field parameters and the visual image processing effects. This model is also used as the tool for two-dimensional enhancement of images.

This paper was received for publication on 23 Sep 80.

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TITLE: "The Optical System of Kinetic Spectrophotometer"

SOURCE: Beijing SHENGWU HUAXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 4, Aug 81 pp 53-58

ABSTRACT: Based upon understandings gained in the process of studying and making the microsecond kinetic flash photolysis instrument, the authors introduce in the paper the structure design of the optical system of a kinetic spectrophotometer and the major design consideration, which is to increase the information to noise ratio. Major components of the kinetic spectrophotometric system, including the light source, the specimen container, the monochromator and filter, the detector, the diaphragm, and the shutter, are explained. There is also a brief introduction of the various applications of a kinetic spectrophotometer.
This paper was received for publication on 21 Aug 80.

5168
CSO: 4009/51

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TITLE: "CZXT-013 and Some Problems in Implementation"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 321-325

TEXT OF ENGLISH ABSTRACT: In this paper, the function and structure of CZXT-013, which is an operating system on the computer 013, are described. Some problems in CZXT-013 design and implementation, such as resource management, process communication, etc., are discussed.

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TITLE: "CZXT-013: A Hierarchical Operating System"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 326-334

TEXT OF ENGLISH ABSTRACT: CZXT-013 is a batch-processing operating system, capable of handling eight jobs simultaneously. This paper describes the architecture design for the system, i.e., the design objectives and the tools (hierarchy, process and modularity) which are needed to realize the objectives. The kernel primitives and their design considerations are illustrated in detail, and the function of each process, process control and communication are also described. The experiences gained in the course of design are presented at the end.

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TITLE: "The Design of CZXT-013 Job Control Language and the Implementation of Job Control"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 335-343

TEXT OF ENGLISH ABSTRACT: This paper describes a user-oriented job control language, CZXT-013 JCL. The design principle and some specific commands are presented. Some key problems in realizing the CZXT-013 job control, such as event and condition command, information notification and log file, log-out treatment and fault treatment, are discussed. Their processing methods are also given.

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TITLE: "The Job Management in CZXT-013"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 344-351

TEXT OF ENGLISH ABSTRACT: CZXT-013 is a batch-processing oriented operating system which facilitates on-line operations as well. This system permits three types of jobs to run simultaneously. This paper presents the job scheduling scheme of the CZXT-013 system which is realized in three layers. The paper also describes the states of the jobs in different stages from entering to leaving the system, the state transitions, preparations for the job running and ways to handle the jobs in their normal and abnormal departures.

AUTHOR: FAN Benkui [5400 2609 6652]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Management of Virtual Storage in CZXT-013"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 352-360

TEXT OF ENGLISH ABSTRACT: CZXT-013 provides a multiple page virtual storage system. This article presents a management technique of the virtual storage from the point of view of the software. A description is given of how the virtual storage is implemented from the auxiliary storage management, main storage management and page management (page fault handling, page replacement role, etc.).

The efficiency of the virtual storage is discussed and several prime factors that affect the efficiency of the virtual storage are analyzed as well.

AUTHOR: LI Zhichen [2621 1807 5256]
GU Yuqing [7357 3022 3237]
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ORG: All of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Input/Output Management of CZXT-013"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 361-366

TEXT OF ENGLISH ABSTRACT: Input/output management of CZXT-013 is divided into two parts--logical device management and physical device management. This article describes the considerations and features of logical device, format processing and device management.

AUTHOR: LIU Guoheng [0491 0948 3801]
CAI Chunlei [5591 2504 7191]

ORG: Both of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "CZXT-013 Testing and Debugging"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 367-371

TEXT OF ENGLISH ABSTRACT: In this paper the relation between the reliability and testing of an operating system is discussed first. Then the testing and debugging project of CZXT-013, the computer 013 operating system with hierarchic structure of processes, is described. Two testing tools, process tester and system monitor, were used in unit testing phase and integration testing phase respectively.

Process tester is a common testing routine for testing process modules. System monitor is a set of output routines attached to the central parts of system control and responsible for the collection of information.

AUTHOR: QU Yanwen [1448 1693 2429]
LI Xin [2621 6580]

ORG: Both of Huabei Institute of Computing Technology

TITLE: "Waveform Algorithm for Logic Simulation--A Process-oriented Logic Simulation Algorithm"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 372-383

TEXT OF ENGLISH ABSTRACT: The current algorithms for logic simulation are event-oriented. A process-oriented, highly time-parallel algorithm, called waveform algorithm, is first presented in this paper. With this algorithm, the efficiency of logic simulation is improved. The formula for a flip-flop is also given.

AUTHOR: ZHOU Xingming [0719 5281 6900]
ZHANG Minxuan [1728 3046 6693]

ORG: Both of Changsha Institute of Technology

TITLE: "A Theoretical Analysis of Reciprocal Iterative Algorithm and a Discussion of Its Schemes"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 384-391

TEXT OF ENGLISH ABSTRACT: This paper investigates the algorithm of reciprocal iteration. A theoretical analysis of the structure and accuracy control of the initial reciprocal approximation table is described, and an economical and simple hardware scheme of the reciprocal table is put forward. A general method for tolerance analysis and accuracy control is introduced to analyze four different schemes of iterative algorithms. Finally, as an example, the design of approximate reciprocal pipeline is given. In this design the number of pipeline stages and the amount of chips are considerably reduced with the aid of the theoretical analysis mentioned above.

AUTHOR: WANG Changqi [3769 7022 1142]
JIN Xiaolong [6855 2556 7893]
LI Meng [6786 5492]

ORG: All of Shanghai Institute of Railway Technology

TITLE: "Complex Disjunctive Decomposition of Incompletely Specified Three-valued Logic Functions"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 392-399

TEXT OF ENGLISH ABSTRACT: In this paper, S. Lee Hight's theory of complex disjunctive decomposition of incompletely specified Boolean functions is extended to the realm of incompletely specified three-valued logic functions. According to different partitions of a set of input variables of the three-valued logic function, the compatibility relations of column (row) vectors of the three-valued logic function can be found. The DON'T CARE (d) conditions are assigned for the first time and it is required for the second time to determine the compatibility relations of the constrained vectors of the three-valued logic function and to assign the d conditions. Therefore, a method is given with which we can find simple disjunctive decompositions and then form complex disjunctive decompositions for the incompletely specified three-valued logic functions.

9717
CSO: 4009/31

Electric Locomotive

AUTHOR: CHEN Mengping [7115 1322 1627]

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TITLE: "Stacked Rubber Sandwich Test"

SOURCE: Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 3, 81 pp 46-48

ABSTRACT: A stacked rubber spring has been extensively used on railroad locomotives and cars because unlike steel springs, it can be changed into all sorts of shapes to produce different stiffness from the front to the rear to satisfy the vibration attenuation requirement and to hold a steady position as well. Its introduction greatly simplified the designing of the bogie structure. Its good horizontal elasticity also makes it suitable for locomotives. At present, many countries are using rubber springs as suspension springs and the most common type is the stacked rubber. In 1975, the author and colleagues carried out a study on the mechanical property of rubber with a rubber stack installed in a ND4 internal combustion locomotive, a dynamic test of its vertical compression stiffness and horizontal shear stiffness, a fatigue test to measure its useful life, and a static property and fatigue test of the stacked rubber used in the Shaoshan-3 electric locomotive made in China. The various test data are reported.

AUTHOR: WU Jun [0702 3182]

ORG: Emei Internal Combustion Engine Service

TITLE: "Analysis of the Dongfeng-1284 Diesel Locomotive Beyond-the-Scope Repair--On the Treatment of Surface Blackening of the Commutator of the 1350 Main Generator"

SOURCE: Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 3, 81 pp 49-51

ABSTRACT: Indication of trouble in the reverser began to appear when the Dongfeng-1284 locomotive was in operation less than 500 km after a major overhaul. The burned out brushes were replaced. After another 320 km, the blackening phenomenon of the septum appeared again. The power of the locomotive dropped and the engine temperature rose. After further testing and adjustment, it was decided that it could not be repaired on the track. The author and colleagues installed brushes of 2 different serial numbers (D252 and D374D) although according to the regulation brushes of identical serial numbers should be used. After such a treatment, the locomotive has been in operation for 20,000 km. The oxidation film of the reverser remains good and the brush surface shiny.

AUTHOR: ZHANG Haiying [1728 3189 5391]

ORG: South Section, Zhengzhou Maintenance Crew

TITLE: "Experiment With Reconstructing the Oxidation Film of the ZQDR-204 Electric Locomotives"

SOURCE: Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 3, 81 p 50

ABSTRACT: Ever since the Dongfeng electric drive internal combustion locomotives began to operate in the south section of Zhengzhou, the reverser surface oxidation films under some brushes have frequently become broken or lost during the cold, dry, and windy winters. New brushes often wear out after running 200-300 km. The trouble was often mistakenly thought to be a deformed plate in the reverser. In reality, under the adverse weather condition, with the relatively low current density, the oxidation film breaks down gradually and will disappear completely. The author and colleagues, during Jan 1976, tried a method of removing the negative brush and allowing all 3 positive brushes on each row to remain. The current of each motor was controlled in the range of 500-600 amp and the temperature of the reverser at 50-60°C. In this manner, a new oxidation film was established after a distance of 203 km. The negative brush was reinstalled at that point and the motor operated normally. The same method was tried again on 5 Feb 80 and the result was equally satisfactory.

6168
CSO: 4009/63

AUTHOR: SHEN Zongshu [3088 1350 2885]
GAO Ke [7559 2688]
ZHANG Dehan [1728 1795 3352]

ORG: SHEN of the Hydropower Automation Teaching and Research Group, Department of Electric Power, Huazhong Institute of Technology; GAO and ZHANG both of the Electromechanical Group, Kunming Survey and Design Institute, Ministry of Electric Power Industry

TITLE: "Stability and Operation Boundaries of Water Turbine Regulating System"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 3-11

TEXT OF ENGLISH ABSTRACT: This paper demonstrates that, according to field tests and operation experience of a two-cascade hydroelectric station, the theory of stability and operation boundaries is applicable to water turbine regulating systems.

AUTHOR: WU Jianguo [0702 0256 0948]
GUO Xijiu [6753 6932 3773]

ORG: Both of Chongqing Power Industry Bureau

TITLE: "An Error-correcting Program for Computer-Computer Communication"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 18-27

TEXT OF ENGLISH ABSTRACT: In this paper, the advantages of employing software for coding, decoding and error-correcting in computer-computer communication are discussed, and two error-correcting programs using the calculation method and comparison method, checked on the CK-720 computer, are proposed. After analyzing advantages and disadvantages of the two methods, the paper indicates that, in general, the comparison method is preferable.

AUTHOR: SHI Shiwen [0670 0013 2429]

ORG: Nanjing Institute of Technology

TITLE: "Analysis of Phase-sensing Circuit for Protective Relaying"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 38-47

TEXT OF ENGLISH ABSTRACT: In this paper, ring-type diode phase-sensing circuits for protective relaying are discussed. First, when input voltage is coincident in phase or opposite in phase, the fundamental principle of the circuits is analyzed. Then, in the presence of any phase difference of input voltages, the relation between average value of output current and phase difference of input currents, and harmonics contained in output current are investigated. The paper concludes that views contained in some of the literature are disputable.

AUTHOR: NIE Tao [5119 3447]
LI Qingxian [2621 1987 7359]

ORG: NIE of the Beifang Jiaotong University; LI of the Nanjing Automation Research Institute

TITLE: "Investigation of Index of Nonlinear Distortion in Data Transmission Channel"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 48-51

TEXT OF ENGLISH ABSTRACT: In this paper, the influence of nonlinear distortion on data signal of channels is analyzed, and thus a formula for calculating the amount of distortion is derived. Taking 600/1200 bit/sec mode, for example, the nonlinear distortion index of data transmission channel is determined.

9717
CSO: 4009/56

Loading, Unloading Machines

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TITLE: "General Situation and Developing Tendency of Harbour Loading and Unloading Machines"

SOURCE: Beijing QIZHONG YUNSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese No 3, 6 Jun 81 pp 2-8

ABSTRACT: Water transport has progressed a great deal in recent years. It is estimated that it takes a 50-thousand-ton cargo ship of a speed of 18 knots 16 days to travel 7000 nautical miles but loading and unloading the cargo at 6 harbors in the journey will take up 37 days. Foreign countries do not really have many loading and unloading machines, but what they have are well coordinated and efficiently used. The productivity of China's harbor workers is about 1800 tons/year/person, amounting to only 8 percent of that of advanced countries. After serious analyses, the paper concludes that ways of catching up may be summarized into bulk transport and containerization. Machines needed to load and unload containers and loose cargo of bulk transport are introduced separately. Efficiency of an individual machine does not guarantee high efficiency of the entire transport process, however. The paper points out, finally, that when harbor equipment is selected and the productivity and other parameters of a given piece of equipment is determined, consideration should be given not only to the machine itself, but also to the loading and unloading techniques and the entire transport process of a given type of cargo so that the entire transport process be made economical and reasonable.

[continuation of QIZHONG YUNSHU JIXIE No 3, 81 pp 2-8]

AUTHOR: SHEN Yulin [3088 3768 7792]

ORG: None

TITLE: "The Structure, Manufacture, and Installation of the 200-ton Gantry Crane Used for Shipbuilding"

SOURCE: Beijing QIZHONG YUNSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese No 3, 6 Jun 81 pp 8-19

ABSTRACT: The 200-ton gantry crane system of Tanggu New Harbor of Tianjin was manufactured by Taiyuan Heavy Machinery Plant with the help of Qinghua University. Since it was installed in 1976, the actual production process has proved the crane to meet the basic requirements of design, manufacture, and installation quality. For future development of the shipbuilding industry, the paper recommends this type of crane very highly. In retrospect, the following shortcomings remain, however. (1) The operating track of the crane should be installed to coordinate with the assembly and welding shop, the platform, the yard, the dry dock, etc. so that the crane will not be left somewhere by itself unavailable for use. (2) A pair of gantry cranes with intercrossing tracks may be more reasonable than a single gantry crane. (3) To avoid waste, the manufacturing process should be determined by the total installation design, and the structure design should follow as the third step. (4) Different structures of gantry cranes should be seriously compared to determine the most desired one. (5) Problems of DC motor drive, automatic stop when the wind speed exceeds the limit, ease of adjustment of interspace, etc. are all worthy of further study and improvement.

6168
CSO: 4009/49

AUTHOR: None

ORG: Research Section of Rock Fragmentation, Northeast Institute of Technology

TITLE: "Measurement of Rock Drillability by an Impact Failure Method and Predicating of Drilling Efficiency"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 1-7

TEXT OF ENGLISH ABSTRACT: A simple drop tester that can measure the rock drillability either in fields or in laboratories has been designed and manufactured. The specific energy of impact failure and the wear width of bit edge are used to express the rock drillability. Drillability indices of 806 samples of 62 kinds of rocks taken from 37 mines, tunnels and construction sites have been determined.

The correlations between the drillability indices and the penetration rates of several types of drill equipment have been investigated. Results of their regression analyses indicate that there is a significant correlation between the specific energy of impact failure and the penetration rates.

We suggest the classification of rock drillability by the impact failure method. There are seven rock classes (I-VII) according to the classification of the specific energy of impact failure, and there are three rock kinds (1-3) according to the

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 1-7]

classification of the wear width of bit edge. Both indices are used to express the drillability.

The above classification methods have been adopted by several mines and good results have been obtained.

AUTHOR: YU Xuefu [0060 1331 7450]
QIAO Duan [0829 4551]

ORG: Both of Beijing University of Iron and Steel Technology

TITLE: "Theory of Axial Variation and Three Rules of Axial Ratio for Stabilizing Country Rocks"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 8-15

TEXT OF ENGLISH ABSTRACT: The design of the width and height of underground excavations is determined and corrected mainly based on the equipment specifications and operation conditions, considering various types of support structures. However, in the case of some unstable country rocks and excavations more difficult to maintain, the design method mentioned above neglects the important role of the excavation axial ratio and earth stress in maintaining excavation stability.

The so-called "Theory of Axial Deformation" is designated as a theory of the important effect of the variation in axial ratio on controlling deformation and breakage of country rocks. The earth stress is an essential force causing rock deformation and breakage. In view of this, the excavation axial ratio for stabilizing country rock is directly relative to earth stress.

Based on the fact that earth stress on excavations is different with variation of direction, the present paper applies the three rules, i.e., "axial ratio of

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 8-15]

isostress," "axial ratio of stress distribution" and "axial ratio for stabilizing country rock," to describe the relationship among excavation axial ratios for stabilizing country rock.

AUTHOR: DENG Xipeng [6772 6932 7720]

ORG: Research Institute of Mining, Changsha

TITLE: "The Friction Pairs of Iron Base Alloys and Copper Base Alloys Used in Blast Bits"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 16-20

TEXT OF ENGLISH ABSTRACT: This paper broadly describes the model experimental results of the friction pairs used in blast bits. The influence of the type of friction pair on the properties of anti-adhesion and anti-adhesive wear are investigated in particular. Based on the model experiments, new friction pairs are selected and manufactured. They are iron base alloys and copper base alloys. Their properties of anti-adhesion and anti-adhesive wear are preferable to the friction pair of alloys based on cobalt and alloys based on silver, widely used in the manufacture of blast bits abroad. A definite store of mine experiments shows that the new friction pairs cannot only take the place of the friction pair of Co-AgMn, but can also increase the service life of blast bits. At the same time, the new friction pairs are in accordance with the resources of China and their production cost is very low. Therefore, they are suitable for extensive use.

AUTHOR: SHEN Yingzhu [3088 2503 4554]

ORG: Xiangtan Electrical Machinery Plant

TITLE: "Domestic Model SF-3100 100 Ton Electric Dump Truck for Mines"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 21-26

EXCERPTS FROM ENGLISH ABSTRACT: Studied and designed by the combined efforts of Xiangtan Electrical Machinery Plant, Anshan Metallurgical and Mining Company and Changchun First Motorcar Manufacture Plant, and trial-produced by Xiangtan Electrical Machinery Plant, the Model SF-3100 100 ton electric drive dump truck has been tested in industrial operation for nearly three years. In August, 1980, the First Ministry of Machine Building and the Ministry of Metallurgical Industry appraised its quality and approved trial production of this dump truck in small batches.

The First Ministry of Machine Building has appointed the Xiangtan Electrical Machinery Plant as the manufacturer of the Model SF-3100 100 ton electric drive dump truck. Based on experience obtained in recent years and advice received from relative parties, the quality of trial-produced trucks in small batches will be further improved and the price will be greatly reduced. We are confident that through the joint effort of our customers and our plant, the Model SF-3100 100 ton dump truck will become an effective means of transportation in surface mines and large scale dam projects.

AUTHOR: None

ORG: Shizhuyuan Project Group, Hunan Metallurgical Research Institute

TITLE: "Technological Study of Complex WO_3, Mo, Bi Ore Beneficiation"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 27-31, 15

TEXT OF ENGLISH ABSTRACT: Shizhuyuan ore occurrence, Hunan Province, is the extra big complex deposit in China, containing WO_3, Mo, Bi and Sn minerals and fluorite. Technological processes for treating ores from the deposit were studied by the Hunan Metallurgical Research Institute in cooperation with Beijing Mining and Metallurgical Research Institute, Research Institute of Mining and Metallurgy, Changsha, and Shizhuyuan Polymetal Mine. Commercial-scale experiments on its greisen-skarns ore have been run for five years. The flowsheet tested consisted of coarse grinding followed by gravitation for recovering most coarse tungsten minerals; bulk flotation of wolframite and scheelite; separate cleaning of gravity and flotation rough concentrates; bulk-selective flotation for recovering Mo, Bi minerals and, finally, flotation of fluorite.

The above flowsheet provides satisfactory results, recovering 81.69 percent WO_3, 83.55 percent Mo, 68.29 percent Bi and 28.76 percent CaF_2 in corresponding concentrates, i.e., scheelite, wolframite, molybdenum, bismuth and fluorite

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 27-31, 15]

concentrates, grading 67.52 percent WO_3, 66.29 percent WO_3, 46.72 percent Mo, 29.17 percent Bi and 97.31 percent CaF_2 respectively.

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SHENG Nengqing [4141 5174 1987]

ORG: CENG of the Xiaolong Tungsten Mine, Jiangxi Province; SHENG of Jiangxi Metallurgical Research Institute

TITLE: "Treatment Flowsheet Test of Tungsten Ore Slime"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 32-35

TEXT OF ENGLISH ABSTRACT: The Xiaolong tungsten ore deposit in Jiangxi Province is of the type of high temperature hydrothermal fissure filling, containing wolframite in quartz veins. There is also a small amount of associated scheelite in addition to wolframite. Other metallic minerals are pyrite, chalcopyrite, pyrrhotite, arsenopyrite, etc. Gangue mineral is primarily quartz.

The mine adopted the table for testing the tungsten ore slime of +40μ size, and the flowsheet of centrifugal separator-flotation for testing the slime of 40-10μ size, both achieving good results. When feed grade is 0.64 percent WO_3, a concentrate of 38.75 percent WO_3 can be obtained, with a recovery of 64.71 percent. Operation recovery achieved by the table, centrifugal separator and flotation are 50.14 percent, 66.92 percent and 96.70 percent respectively; the ratios of concentration are 37.5, 49.5 and 2.7 respectively.

AUTHOR: WU Jihui [0124 0679 2547]
LI Youmei [7812 0645 2734]
OU Jinming [0575 6651 2494]

ORG: All of Guangxi Metallurgical Research Institute

TITLE: "Study on Purification of Effluents from Changpo Mill by Flotation-precipitation Process"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 36-43

TEXT OF ENGLISH ABSTRACT: This paper describes the flotation-precipitation process which has been used to purify the mill effluents, in which the contents of Pb, Zn, Cu, Sb, As, Cd, CN^- and xanthate exceed the national industrial water discharge standard. Effluents can be purified under the standard of industrial water discharge only by conventional, inexpensive reagents and, concurrently, some valuable metals can be recovered from the effluents. The effluents contain (mg/1): 3.75 Cu, 80.78 Pb, 31.75 Zn, 20.90 Fe, 0.33 Cd, 58.33 Sb, 2.52 As, 6.40 CN^-, xanthate 0.83, $S^= < 0.5$, with cyanide complex accounting for 79.5 percent. The pH value of the effluents is 6.5.

In order to break the complex, sulfuric acid is first added into the waste water, regulating the pH to a reasonable value. Then sodium sulfide is added, making most of the heavy metal ions precipitate as sulfides. Finally, flotation is employed to separate them from water.

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 36-43]

After the breakage of the complex, the separated heavy metal xanthates can be floated by aeration (ion flotation); all the precipitates are able to float after the addition of a small amount of xanthate (precipitation-flotation); suspensions in the effluents (fine-size lead-antimony mineral) float together with precipitates (ultrafine flotation). This process is a combination of ion flotation, precipitation-flotation and ultrafine flotation. The froth product can be combined into the mill concentrates. By flotation, Cu, Cd, As and xanthate in waste water can be purified under the industrial water discharge standard. More than 85 percent of the Pb, Sb and Zn and some 50 percent of the CN^- can be removed, respectively.

The residual contents of Pb, Sb, Zn and CN^- have not yet come up to the standard, so they need further treatment. For purification, iron sulfite and lime are added to the tail water. Molysite reacts with cyanic ions, forming the precipitate of iron cyanide complex. Lime makes part of the sulfate form the precipitate of calcium salt, while most of it is hydroxide precipitate. The effect of purification is good because of the co-precipitation of hydroxide.

This paper describes in detail the influential factors in the process of effluents purification, such as pH value, the reacting time of sulfuric acid, the amount and reacting time of sodium sulfide, amounts of xanthate and iron sulfite and the reduction of the amount of H_2S, etc. The optimum value is given as a controlling factor of the effluent purification process.

AUTHOR: HU Weibai [5170 3634 2672]
ZHAO Yongquan [6392 3196 3123]

ORG: HU, professor, Central South Institute of Mining and Metallurgy; ZHAO, engineer, Beijing Mining and Metallurgical Research Institute

TITLE: "The Technological Categories of Ores"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 44-49, 43

TEXT OF ENGLISH ABSTRACT: Some suggestions for the establishment of a new course entitled "The Technological Categories of Ores" are first summarized. It consists of systematic classification of important industrial ores according to their technological behavior. The main function of such a course would operate at the preliminary evaluation of the ore, the selection of the processing method, the assertion of treating the flowsheet and the prediction of the feasibility and probable metallurgical results.

Criteria for classification include: beneficiation characteristics, size of liberation, selective leaching and smelting properties, the composition of valuable minerals and gangues, the intergrowth and combination of metallic elements, the ore texture and structure, and other special technological processing factors. Although the classification is very comprehensive, a systematized knowledge of

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 44-49, 43]

mineral processing and extractive metallurgy should be used to arrange the technological categories into rather brief and obvious form. For example, the categories of placer gold ore, uranium ore, ferrous ore and tin containing polymetallic ore are classified as illustrated.

AUTHOR: WEI Shoukun [7614 1108 2492]
HONG Yanruo [3163 1750 5387]

ORG: Both of Beijing University of Iron and Steel Technology

TITLE: "Thermodynamics and Kinetics of the Selective Oxidation of Nickel Matte"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 50-60

TEXT OF ENGLISH ABSTRACT: During direct winning of metallic nickel by blowing nickel matte with oxygen, the key lies in removing sulfur and preserving nickel. In this paper, based on the principle of selective oxidation, a concept of transition temperature of oxidation is introduced. Thermodynamic analysis shows that the conditions for removing sulfur while preserving nickel are:

1. The temperature of starting oxygen blowing of nickel matte must be higher than the transition temperatures of oxidation for sulfur and nickel at the specific compositions of the nickel matte; for the nickel matte with 20-25 percent S, the starting temperature should never be lower than 1350-1400°C.

2. With the decrease of sulfur content in nickel matte melt during blowing, the transition temperatures of oxidation for sulfur and nickel increased correspondingly. The blowing operation should be run fast enough so as to ensure that the rate of increase in the temperature of the melt will always be higher than the rate of increase of the transition temperature of oxidation. The transition temperatures of oxidation for sulfur and nickel can be calculated in one step according to the

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 50-60]

reaction: $[S] + 2NiO_{(s)} = 2[Ni] + SO_2$. In addition, thermodynamic analysis showed that:

1. The copper in the nickel matte remained entirely in the melt and was not oxidized during blowing.
2. The iron in the nickel matte was oxidized most easily, but as soon as its content dropped down to about 0.8 - 1.0 percent, it could not be oxidized further, and remained as residual iron in the melt.
3. Any cobalt in the nickel matte remained as residual cobalt if its original content was below 1 percent.

By maintaining the optimum conditions for removing sulfur while preserving nickel as deduced thermodynamically above, semicommercial experiments in a Kaldo converter were conducted, with the result that sulfur in the matte could be successfully reduced down to 1-2 percent. During the last stage of blowing, due to the slowing down in diffusion of sulfur to the surface of the bath, a layer of NiO was seen accumulating on the surface. Running the converter without oxygen-blowing was taken to eliminate the NiO-layer and promote further lowering in sulfur. The direct recovery of nickel was above 90 percent, while the total recovery of nickel was higher than 95 percent. The loss of nickel was found mainly due to volatilization of the oxide or metal. Thermodynamic prediction of residual copper, iron and cobalt in the metal melt was also experimentally confirmed.

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 50-60]

Kinetics analysis showed that the diffusion of sulfur in the melt was the rate-controlling step for the desulfurization of nickel matte. The mass-transfer and diffusion coefficients (β and D) have the following relations regarding temperature (T) respectively:

$$\beta = 8.30 \exp\left(\frac{-25000}{RT}\right) \quad D = 8.30 \times 10^{-2} \exp\left(\frac{-25000}{RT}\right)$$

AUTHOR: WANG Wenshao [3769 2429 4801]
ZHOU Chengtai [0719 2110 3141]
YANG Deying [2799 1795 5391]
LI Yuzhen [2621 3768 3791]

ORG: WANG and ZHOU both of Shenyang Smelter; YANG and LI both of Liaoning Metallurgical Institute

TITLE: "Fixation of Arsenic in Industrial Calcium Arsenate Sludge at Moderate Temperatures"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 61-65

TEXT OF ENGLISH ABSTRACT: The sludges containing arsenates were generally formed during the removal of arsenic with limestone from waste water or effluent generated in nonferrous metallurgical processes. But these arsenates in the sludges were characterized by being able to dissolve in water to a certain extent, and they could not be directly discharged to land or sea area. This paper describes the fixation of arsenic in industrial calcium arsenate sludge by a simple calcination process at moderate temperatures. The typical sample used contained 7-8 percent As and 26-32 percent CaO. It was generated from the effluent after recovering indium and germanium in the zinc hydrometallurgical process. Samples in dry or slurry states were calcined in the temperature range of 400-800°C for one to three hours, and then the calcine products were leached by water at different pH values

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 61-65]

to determine how many arsenates in them had become insoluble crystalloid. At the same time, the calcine products were examined by an X-diffractometer to observe what changes had happened in them. The results obtained [illegible]d that the fixation of arsenates could be achieved completely by calcinatio[illegible] [illegible])°C for one hour, and the arsenic concentration in the leaching solution o[illegible] [illegible] calcine less than 0.5 mg/l, which might meet the emission standard of the state environmental protection legislation. Thus the method could be considered an acceptable approach for the pollution-free disposal of the calcium arsenate sludge.

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TITLE: "Discussion of Optimum Position of Slag Taphole of the Ore-heat Electric Furnace"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 66-70

TEXT OF ENGLISH ABSTRACT: By sampling the electric furnace in different sections, the dependence between the nickel contained in the slags and the bath deep was found as follows:

$$Y = 1.04 - 1.16h + 0.37h^2$$

For this reason, the slag taphole of the ore-heat electric furnace was moved up from 1.317 to 1.55 m. The practice proved that the nickel obtained in the slags decreased from 0.18 to 0.14 percent in the first six months last year.

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TITLE: "Cone Bipolar Electrolysis"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 71-77

TEXT OF ENGLISH ABSTRACT: A cone bipolar electrolytic cell was proposed, which is a sealed-type electrolytic cell having a raw material aluminum chloride feeding port and chlorine gass discharging ports in a top section and a molten metal reservoir in a bottom section, and is provided with an electrode element in the intermediate section so that a molten salt electrolytic bath containing aluminum chloride is electrolyzed in the cell and molten aluminum is collected from the metal reservoir in the bottom. A method for producing metal by electrolysis in a molten salt bath containing superimposed electrodes, at least one of which is a cone bipolar electrode, is presented. The arrangement of the electrodes creates interelectrode spaces between them. If there are N cone bipolars, this cell has N+1 interelectrode spaces. The spacing is of the order of less than 2.0 cm. A process was suggested for producing aluminum by electrolyzing fused aluminum chloride to produce chlorine gas at the anode surface and molten aluminum at the cathode surface. This method is improved by providing circulation of the bath from an interelectrode space to the next one at a location inside the outer peripheries of the electrodes. This can be accomplished by, for example, boring holes through the cone electrodes. It

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can also be accomplished by breaking the electrodes into individual, mutually separated stacks of electrodes, the circulation of the improvement then occurring, for example, in the space between the stacks. The electrode element is formed of Λ-shaped electrodes laminated at a fixed distance (about 2.0 cm) between the electrodes or a part of right and left electrode plate groups opposite each other at a fixed separation between them and inclined upward and inward. At least one intermediate bipolar electrode is provided between both cathode and anode and a gas centric rising passage is formed between the electrodes.

A molten aluminum falling passage is formed between the outer edges of the cone-shaped electrodes or plate-shaped electrodes and the internal wall of the cell to prevent the rechlorination of the aluminum after electrolysis. The electrolytic bath is of mixed molten salts consisting of 85 to 90 percent by weight NaCl, LiCl, KCl and $MgCl_2$, and 5 to 15 percent by weight $AlCl_3$. Metallic aluminum can be produced by electrolyzing aluminum chloride at a high current and voltage efficiency, reaching about 85 to nearly 90 percent and 55 to 70 percent respectively. This process can be used to produce other metals and alloys, such as magnesium and aluminum-magnesium.

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TITLE: "The Investigation of the Ancient Gold Mine Ruins in Qinling"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 78-79, 65

TEXT OF ENGLISH ABSTRACT: According to stone inscription records, there were extensive mining activities in the ancient gold mines in Qinling, Henan Province, in the Ming Dynasty (1452 AD). Eight hundred old pits have now been found. The detailed investigation in the pits has shown that a rock breaking method with wood combustion and sudden cooling afterwards was widely used at that time, and that gunpowder blasting was also applied. This agrees with the historical records.

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et al.

ORG: None

TITLE: "Famous Antimony Mine--Xikuangshan"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 80-83

EXCERPT FROM ENGLISH ABSTRACT: The Xikuangshan Mine is a world-famous large antimony mine. It was discovered in 1541 and was mined early by the people. It was named Xikuangshan (Tin Mine) because of the mistaking of antimony for tin. It was mined officially in 1892. Smelting of crude antimony was carried out by liquidation of high-purity massive stibnite in 1893. Pure antimony was produced by the Huachang Company in 1908. More than 40 smelters were built by the Chinese mining businessmen and foreign businessmen from England, Germany and other countries during the First World War. The Xikuangshan Mining Administration was set up after the founding of the PRC. Complete technical reformation was carried out at the old mine, with product quality raised and variety and capacity increased. Mineral resources are still rich at present.

The Xikuangshan Mining Administration lies in Lengshuijiang City in Hunan Province with convenient land and water communications. The area of the mining district is 14 sq km, divided into southern and northern sections. Sulfide ores occur at the

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southern part, while at the northern part are oxide and sulfide complex ores. Independent production systems of mining, mineral processing and smelting have been formed because of different kinds of production technology due to different natures of ores: Southern Mine, Southern Concentration Plant, Southern Smelter; Northern Mine, Northern Concentration Plant, Northern Smelter. Auxiliary facilities: maintenance and repair shop, water and electricity sections and transportation, sales departments and antimony hydrometallurgy plant soon to be commissioned. In addition, the Administration also includes a research institute and facilities for design, environmental protection and metering.

Both the Southern and Northern Mines adopt shaft sinking development, room and pillar method and cementation filling for mining. The Southern Concentration Plant utilizes hand picking, heavy media separation and flotation flowsheets. Hand picking-gravity concentration-flotation combined flowsheet is used at the Northern Concentration Plant. The Southern Smelter treats antimony sulfide flotation concentrate and massive concentrate produced by hand picking at the Southern Concentrating Mill. Antimony sulfide is oxidized into antimony oxide through volatilizing smelting or roasting. Antimony metal is formed by reduction smelting and refining of antimony oxide in a reverberatory furnace. The Northern Smelter produces antimony regulus, antimony white and crude antimony, its raw material coming from antimony sulfide and oxide bulk concentrates produced by hand picking, gravity concentration and flotation at the Northern Mill. The production process

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of antimony regulus is approximately the same as that at the Southern Smelter. Some kinds of antimony regulus can be used as the raw material of antimony white, feeding into a special furnace with air blasting to be oxidized into Sb_2O_3. Crude antimony is pure Sb_2S_3, which is made from high grade massive stibnite by heating and liquation.

The quality of the products produced at Xikuangshan Mining Administration has reached the advanced levels of the world, and are able to meet the demands of users at home and abroad. Antimony regulus No 1 had the honor of winning a silver medal in September, 1980, because of its high quality.

According to the standard GB 1599-79 of the PRC, the following products can be supplied:
Antimony regulus No 1 (Sb-1) (99.85 percent Sb);
Antimony regulus No 2 (Sb-2) (99.65 percent Sb);
Antimony regulus No 3 (Sb-3) (99.5 percent Sb);
Special antimony white (Sb_2O_3-01) (99.5 percent Sb_2O_3);
Antimony white No 1 (Sb_2O_3-1) (99.0 percent Sb_2O_3);
Crude antimony (Sb_2S_3-1) (70-73 percent Sb).

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CSO: 4009/34

AUTHOR: ZHANG Gongan [1728 0501 1344]

ORG: Department of Mathematics

TITLE: "The L_2-theory of Dirichlet Problem for Strongly Elliptic Systems with Unbounded Coefficients"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 1-17

TEXT OF ENGLISH ABSTRACT: In this paper we made use of Ladyzhenskaya's methods to consider a Dirichlet problem for strongly elliptic systems, the leading coefficients of which are to be continuous in domain Ω and other coefficients in space $L_3(\Omega)$.

In the first part of this paper we obtain the Garding inequality and uniqueness theorem of the solution to the Dirichlet problem. In the second part we prove the existence of this solution. The proof is based on the representation theorem. In addition, we solve the eigenvalue problem using the Lax-Milgram theorem. In the third part we give the proof of the differentiability of generalized solutions. The proof proceeds by differencing the equations and applying the Garding inequality to derive estimates for the difference quotients of the solution.

AUTHOR: SHAO Zhenhao [6730 7201 6275]
LI Jiaren [2621 1367 0088]

ORG: Both of the Department of Mathematics

TITLE: "The Computation of Interior of Large Cooling Tower"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 18-26

TEXT OF ENGLISH ABSTRACT: In this paper we have carried out the computation of internal forces of a large cooling tower with wind load. The numerical solutions with boundary conditions and the difference between moment solution and non-moment solution are given here.

AUTHOR: ZHAO Weili [6392 3634 4409]

ORG: Department of Mathematics

TITLE: "A Class of Singular Perturbations of Boundary Value Problems for Ordinary Differential Equations on Infinite Interval"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 27-36

TEXT OF ENGLISH ABSTRACT: In this paper we prove the existence, uniqueness and convergence of a class of singular perturbations of boundary value problems on infinite interval for ordinary differential equations

$$\begin{cases} \varepsilon \dfrac{d^2x}{dt^2} = F(t,x)\dfrac{dx}{dt} + G(t,x), \\ x(-\infty,\varepsilon) = a, \ x(\infty,\varepsilon) = b \end{cases}$$

under certain conditions. Here ε is a small positive parameter, and a, b are given constants.

AUTHOR: ZHOU Qinde [0719 2953 1795]

ORG: Department of Mathematics

TITLE: "The Asymptotic Expansions of the Solutions of a Class of Singular Perturbation Boundary Value Problems"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 37-50

TEXT OF ENGLISH ABSTRACT: Taking the problem of smoothing the discontinuous self-similar solutions of the system of hyperbolic equations as a research background, in this paper we discuss the asymptotic expansion of the solution of the equation of second order with a small parameter $\varepsilon > 0$

$$\varepsilon u'' = F(\xi,u)u'$$

which satisfies the boundary value conditions

$$u(\pm\infty) = u^{\pm}(\varepsilon),$$

where $u^{+}(0) < u^{-}(0)$. This paper is a generalization of a previous article.

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TITLE: "Initial Boundary Value Problems for Some Nonlinear Incomplete Parabolic Systems (I)"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 51-59

TEXT OF ENGLISH ABSTRACT: In this paper we consider periodic and first boundary value problems for nonlinear incomplete parabolic systems

$$\begin{cases} u_t - a u_{xx} - [p(u,v)]_x + f(u,v,u_x) = 0, \\ v_t + b v_x + g(u,v,u_x) = 0 \end{cases}$$

and give sufficient conditions to ensure the existence and uniqueness of global solutions by means of the theory of nonlinear semigroups.

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ORG: Both of the Institute of Atomic and Molecular Physics, Jilin University

TITLE: "The Method of Numerical Solution of Mach-Zehnder Interferogram Analysis of Supersonic Airflow about Cylindrical Symmetric Projectiles"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 60-71

TEXT OF ENGLISH ABSTRACT: The method of numerical solution of four physical conclusions and "The Abel Transformation of Plasma Spectroscopy Involving Shock Waves" obtained by the same authors in a previous article is extended to Mach-Zehnder interferogram analysis of supersonic airflow about cylindrical symmetric projectiles. Three similar physical conclusions about the relation between the interferometric fringe shift, $\delta(x,z)$, measured from M-Z interferogram, and the density difference, $\rho(\lambda,z)-\rho_0$, at each point in the supersonic airflow field are botained, and all transformation coefficient formulas used to calculate the density difference, $\rho(\lambda,z)-\rho_0$, according to the interferometric fringe shaft, $\delta(x,z)$, are given. As an example, using experimental data given by Bennett, airflow field of cylindrical symmetric projectiles is calculated and better results have been obtained. A simplified calculation method which deals with many shock waves existing in the airflow field is given.

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TITLE: "The Graph Analysis of the Living Polymerization with Monomer Transfer"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 72-84

TEXT OF ENGLISH ABSTRACT: A new graph analysis method based on the probability functions of the basic processes in addition polymerization is presented. It is applicable to any system of addition polymerization. The problem of monomer transfer in living polymerization is treated theoretically. The molecular weight distributions and the average degrees of polymerization have been obtained by this method. The properties of the distribution under some conditions are discussed.

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ORG: CHENG, WANG Jindui, WANG Jingtiao and WANG Zhizhong all of the Department of Chemistry; WANG Yuwen of Yitong Scientific Experiment Station of Agriculture

TITLE: "Studies on the Cause of Vigorous Growth of Plants Grown in the Fairy Ring (I)--The Relationship between the Mycelium of *Lepista caespitosa* in Soil and the Growth of Plants"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 85-91

TEXT OF ENGLISH ABSTRACT: *Lepista caespitosa*, which causes the formation of Fairy Ring, has been isolated from the tissue of fruiting bodies and from sporidium. It is different from *Tricholoma gambosum* in some physiological and biochemical characteristics. By using the method of sheet glass buried in soil, thick mycelium was found under the Fairy Ring, and the Fairy Ring moved along with the development and stretch of the mycelium. It is clearly shown that Fairy Ring is caused mainly by the metabolites of the mycelium rather than from the nitrogen source from the decomposition of the mycelium.

[Continuation of JILIN DAXUE ZIRAN KEXUE XUEBAO No 3, 20 Aug 81 pp 85-91]

The high yield of the crops (soybean, wheat, corn, Chinese sorghum and millet) on the Fairy Ring were obtained for several years.

AUTHOR: LAI Zhugen [6351 2691 2704]
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TITLE: "The Quantum Chemical Basis of Effect of Opposite Terminal Groups in Conjugated Polyenic Compounds"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 92-100

EXCERPT FROM ENGLISH ABSTRACT: Recently Dai, et al., studied the electronic spectra of the conjugated polyenic compounds with two terminal groups polarizing in opposite directions, and introduced the concept of the effect of opposite terminal groups. The object of this paper is to study the effect of such groups on a quantum chemical basis.

AUTHOR: GUAN Jiwen [4619 4764 2429]

ORG: Department of Computer Sciences

TITLE: "On Linear Automata (V)--State Diagrams (The General Case)"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 101-120

TEXT OF ENGLISH ABSTRACT: In this paper we have presented the general expression of the state diagram of a general linear automaton and a sufficient and necessary condition that a set of plane graphs is realizable as the state diagram of a general linear automaton. Also included is the method for constructing such a linear automaton realizing this set of graphs in the realizable case.

AUTHOR: LI Guangrong [2621 1639 2837]

ORG: Department of Computer Science

TITLE: "The Linearization and Digitalization of Scale Value for Platinum Resistance Thermometer"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 121-128

TEXT OF ENGLISH ABSTRACT: A linearized method for scale value of platinum resistance thermometer is described. The circuit is simple and the method is more accurate. In the range of 100-400°C and 300-600°C, the errors of the linearization of scale value are less than 0.02 percent.

The circuit for linearization can be applied to accurate temperature program control or fixed-point control after it is matched with an electric or manual resistance box. Some practical problems are also discussed.

The circuit provided here has been successfully applied in the temperature control of the measuring instruments of plastic parameters.

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